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CENTRAL INTELLIGENCE AGENCY  
INFORMATION REPORT

COUNTRY Germany (Soviet Zone)

SUBJECT Description of Zeiss Ikon ZL-1 High Speed Camera/  
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1.

Zeiss Ikon High Frequency Camera ZL-1 - 35 mm - is a new design based on the approved principles embodied by the Zeiss Ikon high speed motion camera which has been used with best success for more than two decades, but also incorporates the experience gathered during this period. It is a standard film cine camera for extremely high frame speeds used for the investigation of very rapid movements. While the ordinary frame speed for exposure and screening amounts to 24 frames per second, the frame speed of the High Frequency Camera ZL-1 can be increased to more than sixty times this value, the film travelling at a speed of more than 60 miles per hour through the camera. If the film is screened at the ordinary frame speed, the time scale is correspondingly magnified. So to speak, the time is visualized through a magnifying glass. Of course it is not possible at these high speeds to run the film intermittently, indeed it travels continuously, and the rays emanating from the object, are projected upon it over revolving mirrors, forming a stationary picture on the film.

The highest speed of frames amounts to 1500 per second for the size of 18 x 24 mm., and 3000 per second for size 9 x 24 mm. Frequencies of 250, 500, 750 and 1000 frames per second can moreover be attained by exchangeable driving wheels, while a hand crank is provided for low frequencies of up to 100 frames per second.

The drive is by a 220/380 V 50 cycles three-phase a c motor.

The film transport is actuated over an electro-magnetic coupling.

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The internal crown of mirrors serving for optical compensation is easily exchangeable. Two crowns of mirrors are supplied, one consisting of 30 mirrors for size 18 x 24 mm, and one consisting of 60 mirrors for size 9 x 24 mm.

The greatest length of film amounts to 50 m (160 ft). It is kept in a double cassette with automatically closing film mouths which also open automatically when the camera is closed.

Large size winding and unwinding sprockets are arranged so that the film is guided to the gate without looping and free from additional own movements.

The practical optical arrangement forms a picture with the right side up. This is a decisive advantage over the former time magnifier model allowing pictures to be copied into standard films.

The optical equipment consists of two objectives reproducing the object over an intermediate image on the film. The reproducing objective is firmly built into the camera, its focal length being 45 mm and the aperture-to focal length ratio 1:2. The second objective is fitted outside for focusing. Two objectives are supplied for this purpose along with the camera, viz, one standard objective and one telephoto objective magnifying to eight times of the former. The focusing range of the standard objective is from 1 m (3 ft) to infinity, and of the telephoto objective from 5 m (15 ft) to infinity.

Time Mark Transmitter. Supplementary lenses fitted to the telephoto objective allow for reproduction scales of 1:1, 1:2, and 2:1. Two view finders are provided for, viz, one telescopic finder for rough adjustment, producing an image with the right side up, as well as a focusing magnifier for 5-fold magnification for viewing and focusing the image on the film.

For recording time marks and other marks, two punctiform discharge lamps mounted in a detachable casing are provided for, the light points of which are reproduced in the margin of the film.

A tuning-fork controlled time mark transmitter generates the impulses of 1000 or 50 Hz required for the operation of the time mark discharge lamp.

A tachometer indicating the frame speed is mounted to the rear wall of the camera.

A built-in heating system controlled by a thermo switch allows the camera to be used at temperatures down to -50° C.

The measurements of the substantial special tripod are as follows:

Smallest height of the optical axis: 1 m (3 ft)  
 Greatest height of the optical axis: 1.70 m (5 ft)  
 Inclination of tripod head  $\sim 15^\circ$   
 Revolving angle of tripod head  $360^\circ$

A switching equipment designed in trunk form, will be delivered with the camera, comprising:

Connections for mains, motor, heating, coupling, time marking, and remote action control.  
 Rheostat with instrument for adjusting the coupling current.  
 Push button master switch.  
 Push button switches and pilot lamps for motor circuit, coupling, and zero key.  
 Rectifiers for the generation of the coupling current.  
 Relays for remote control of the apparatus.  
 Remote control box with 30 m (90 ft) cable, as well as all connecting cables with non-interchangeable plug junctions.

One rewinder with waxing device is included in the delivery.

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The whole equipment is accommodated in six transport trunks, containing:

- Trunk 1: Cine camera. Taking lens and view finder lens. Time marking device.
- Trunk 2: Telephoto lens and objectives for scale reproductions.
- Trunk 3: Crown of mirrors for 3000 frames per second.
- Trunk 4: Tripod head, driving motor, rewinder with waxing device.
- Trunk 5: Tripod legs
- Trunk 6: Switching equipment.

2. In spite of Zeiss calling this a "new design" it is essentially the same camera which they made about 1934, and is definitely antiquated by US standards.
3. The top speed of 1500 full frame or 3000 half frame pictures per second is not fast enough for many uses. When examining extremely high velocity phenomena, speeds of up to 16,000 pictures per second are sometimes necessary. [REDACTED] that by making a complicated and tedious gear and mirror change, the Zeiss camera can be made to produce about 6000 quarter frame pictures per second, but this is still not very fast, and quarter frame pictures, that is, four pictures per standard 35 mm frame, are difficult and inconvenient to use.
4. The Zeiss camera sells for about US\$30,000, which is several times the cost of better US camera..
5. The Zeiss camera is both bulky and heavy. These are faults which would seriously limit its usefulness.

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